§8. Effect of Elliptically Polarized EC-wave Beam on Plasma Heating

Yoshimura, Y., Minami, T., Isobe, M., Suzuki, C., Nishimura, S., Shimizu, A., Takahashi, C., Okamura, S., Matsuoka, K., Kubo, S., Idei, H., Shimozuma, T., Notake, T., Ohkubo, K.

A plane mirror on 53.2GHz EC-wave power transmission line of CHS was replaced with a grating polarizer, named polarizer β, which has dimensions of grating depth of λ/8 = 0.7mm, width of 1.5mm and period of 2.0mm. The beam incident angle measured from the normal of the surface of polarizer β is about 10 degrees. With this depth and small beam incident angle, polarizer β can be considered to be a circular polarizer which can change the ellipticity of reflected wave. The polarization parameters such as rotation angle and ellipticity are decided according to the relation between polarization parameters of incident wave and grating direction (rotation angle) of polarizer β.

The change of property of plasma incident wave caused by polarizer β is confirmed by a power measurement at the opposite port to the injection port. Two detectors measure the power components in radial and toroidal directions, corresponding to the square of amplitude of electric field oscillating in respective directions. In this measurement, rotation angle of another grating polarizer, a polarization rotator, is kept constant at an angle where the radial component of incident beam power is minimum before the replacement for polarizer β. The result is plotted in Fig. 1. The reflected wave leaving the polarizer β changes its ellipticity and rotating direction of electric field. The rotating direction at shaded regions is opposite to that at the other regions.

In the experiment of oblique injection of EC-wave, both of the beam direction (right and left side injection) and the magnetic field direction (CCW and CW) are changed in combination with rotation of the polarizer β. The magnetic field is 0.95T at magnetic axis, that is, 2nd harmonic condition for 53.2GHz wave. The polarization rotator is kept at the same rotation angle described in Fig. 1. The results are summarized in Fig. 2. The tendency of variation of plasma parameters against the rotation of polarizer β is reversed according to the change of the beam direction or magnetic field direction. It can be explained as follows; effective plasma heating is achieved when the rotating direction of electric field of the obliquely injected EC-wave coincides with that of gyro-motion of electrons.

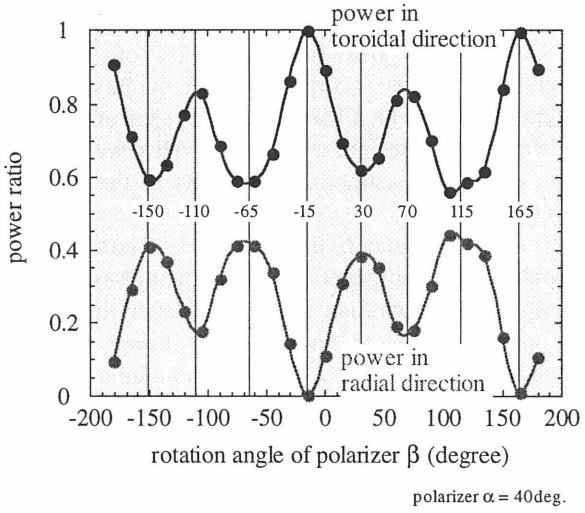

Fig. 1 Change of injected wave property caused by rotation of polarizer β

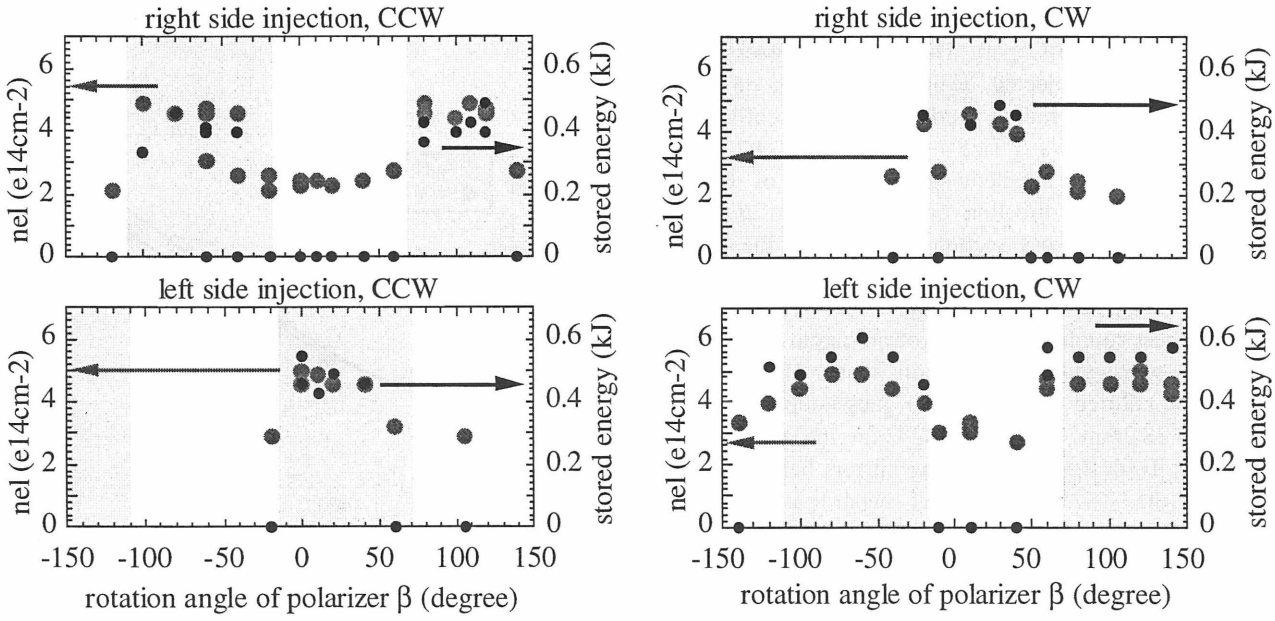

Fig. 2 Summary of EC-wave oblique injection experiment